State–of–the–Art Hydroacoustics as a River Fisheries Assessment Tool

R. C. Tipton and K. J. Hartman

Wildlife and Fisheries Program
Division of Forestry
West Virginia University
P. O. Box 6125
Morgantown, West Virginia
26506-6125

Abstract

Hydroacoustics may provide a rapid and effective method for surveying fish distributions in riverine systems. To begin the application of hydroacoustic techniques to rivers we conducted a verification study between hydroacoustics and lock rotenone samples and also surveyed the distributions of fish relative to a power plant intake. For the acoustic verification we acoustically surveyed relative fish density at the New Cumberland, Hannibal, and Belleville locks, on the Ohio River, using a SIMRAD EY-500 echo-sounder coupled with a 120 kHz split-beam transducer. The survey was performed prior to the application of rotenone by West Virginia Division of Natural Resources personnel; on 15, 16, and 17 September 1998, respectively. Our intent was to compare results of acoustic vs. rotenone density comparisons from three different sites the previous year.

The 1997 surveys on the Ohio River's Willow Island and Racine locks compared favorably with rotenone assessments. Estimates obtained from three 1998 lock surveys provided additional information on which to test the expected 1:1 relationship between acoustic and rotenone estimates. Differences in relative fish density estimates for acoustic vs. rotenone did not deviate significantly ($p<0.05$) from the expected 1:1. Additionally, we acoustically sampled fish from seven transects on the Hudson River, New York; in the vicinity of Bowline Power Generating Station. Total average relative density estimates were obtained for four size classes of fish using a 120 kHz split-beam hydroacoustic system. Size classes sampled were 12–90 mm TL, 91–160 mm TL, 161–300 mm TL, and 301–1000 mm TL, respectively. Transects were sampled in two-hour intervals over a twenty-four hour period on 16 and 17 July 1996. Three transects were sampled within 100 m of intake structures inside a secluded 49-hectare lagoon (near field), while the remaining four transects were sampled > 100 m away in the Hudson River proper (far field).

Multivariate analysis of variance was used to determine significant ($p\leq0.05$) fish total average density by size class for near field vs. far field and daylight vs. dark conditions over the diel period. Results indicated an overall near field dark preference by the smaller size classes, 12-90 mm TL and 91-160 mm TL respectively. Preference trends exhibited by small fish broke down as total length increased to the larger size classes, 161-300 mm TL and 301-1000 mm TL respectively. The results of these two studies show that hydroacoustics can be reliably applied to the study of abundance and distributions of fishes in riverine systems. We believe that hydroacoustic techniques hold promise for studies of fish and their relationship to habitat features in Appalachian Rivers.